



# CULTIVATION OF INNOVATIVE AWARENESS OF NEW ENGINEERING TALENTS IN PHARMACEUTICAL ENGINEERING UNDER THE INTEGRATION OF NEW BUSINESS FORMS AND NEW TECHNOLOGIES

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## ABSTRACT

In order to solve the problem of how to cultivate the innovative consciousness of new engineering talents in pharmaceutical engineering under the background of the cross-integration of new business forms and new technologies, this paper combined with the actual characteristics of pharmaceutical majors and carried out comprehensive measures from the aspects of education concept, curriculum system, teaching methods, innovation atmosphere, teamwork and cross-cultural communication ability. The combination of traditional engineering education and “new engineering” education lays a theoretical and practical foundation for training high-quality talents with innovative spirit and practical ability to meet the development needs of the future pharmaceutical engineering field

**KEYWORDS:** Innovative Awareness, Cultivation, New Engineering Talents, Pharmaceutical Engineering

## 1. INTRODUCTION

The pharmaceutical industry is a pillar industry of national economy and also an important industry supported by the national strategy. Pharmaceutical engineering is an engineering specialty of chemistry, biology, pharmacy and engineering. The Ministry of Education established the “Chemical and pharmaceutical engineering” specialty in 1998. In the past 20 years, it has transported about 16,000 graduates every year for the development of the pharmaceutical industry, directly or indirectly serving and affecting the overall level of regional economic and social development and people’s health. In the face of the development of new business forms, new technological changes and new engineering construction in the pharmaceutical industry, the cultivation of innovative consciousness of new engineering talents in pharmaceutical engineering is a complicate and systematic process, which requires the education system not only to pay attention to students’ professional knowledge and skills, but also to cultivate students’ innovative thinking, practical ability and interdisciplinary integration ability. The main strategies and methods for cultivating innovative consciousness of new engineering talents in pharmaceutical engineering are as follows:

## 2. THE STRATEGIES AND METHODS FOR CULTIVATING INNOVATIVE CONSCIOUSNESS OF NEW ENGINEERING TALENTS

### 2.1 Update the educational concept and strengthen the awareness of innovation

#### 2.1.1. Establish an innovation-oriented education concept

1) Emphasize student-centered and encourage students to actively explore, question and innovate.

In the teaching process, adhere to the principle of “student-oriented” and “student-centered”, pay attention to the organic

integration of knowledge, ability and quality, strengthen students’ comprehensive ability to solve complicate problems and the training of advanced thinking, and encourage students to actively explore, question and innovate.



Establish the engineering education concept of “facing the industry, facing the future and facing the world”, focusing on cultivating students’ international vision and cross-cultural communication ability.



### 2.1.2 Integration of new formats and technologies

1. Keep up with the development trend of the pharmaceutical industry, introduce new technologies such as artificial intelligence, big data, cloud computing and Internet of Things into the classroom, so that students can understand and master the latest industry trends and technology applications. Keeping up with the development trend of the pharmaceutical industry, combined with the innovation research of the teaching syllabus of core course and course content of the pharmaceutical engineering major, the basic knowledge required by big data, cloud computing and artificial intelligence is integrated into the teaching content such as green pharmaceutical, clean technology and intelligent manufacturing.
2. Guide students to pay attention to new problems and challenges in the field of pharmaceutical engineering under new business formats, and stimulate students' enthusiasm and motivation for innovation.

## 2.2 Optimize the curriculum system and strengthen practical teaching

### 2.2.1 Building interdisciplinary curriculum system

1. Breaking the traditional discipline barriers, building a curriculum system with pharmaceutical engineering as the core, integrating chemistry, biology, engineering, information technology and other disciplines.
2. Introduce comprehensive courses such as pharmaceutical engineering design, pharmaceutical process optimization, and research and development of new drug to cultivate students' interdisciplinary integration ability and innovation ability.

### 2.2.2 Strengthen practical teaching

- 1) Increase the proportion of experimental courses, practical training courses and practice courses, so that students can master the basic skills and methods of pharmaceutical engineering in practice.
1. Using the digital pharmaceutical factory design platform and experience of Sinopod Joint Engineering Co.,LTD., Shanghai Xinzheng Company and other enterprises,

the deliverable PID drawings of the pharmaceutical engineering design course can be converted into the teaching platform and model research of digital factory, and the rationality and response of safety control system under abnormal conditions were tested through operation.

2. In view of the current backward state of virtual simulation of production practice which is basically operation demonstration, with the help of the digital concept and method, explore the cooperation with relevant universities and enterprises to jointly establish a virtual simulation practical training system which is equivalent to the current level of industrial manufacturing technology.
3. The existing experimental and practical training equipment system were transformed and improved by using the artificial intelligence, big data, Internet of things and other new technologies and new ways, make it can become an innovative platform for students to practice training, so that students can more directly understand, experience and master the basic elements of intelligent manufacturing, significantly improve the level of experimental and practical training. At the same time, cooperate with companies that are good at developing practical training and internship simulation software technology, design institutes that are familiar with digital and intelligent pharmaceutical factory design, and pharmaceutical enterprise experts who develop and apply new technologies to jointly study new teaching content and new teaching methods.

2) Provide more practical opportunities and platforms for students through school-enterprise cooperation and the combination of industry-university-research. Allow students to exercise and grow in a real working environment. Increase the proportion of experimental training and practice courses, strengthen the practice ability, and constantly improve the quality and efficiency of engineering practice innovation education. Pay full attention to students' knowledge practice, production practice and graduation practice, strengthen the connection with well-known domestic enterprises such as Tianfang Pharmaceutical and Yuchen Pharmaceutical, and strive to build a "first-class undergraduate engineering practice innovation base of "integration of production and education and collaborative education"

## 2.3 Reform teaching methods to stimulate innovation potential

### 2.3.1. Implement problem-oriented teaching methods

1. Guide students to study and research on practical problems in the field of pharmaceutical engineering, and cultivate students' problem awareness and problem-solving ability.
2. Encourage students to participate in scientific research projects, innovation competitions and other activities, so that students can exercise innovative thinking and practical ability in practice.

### 2.3.2 Adopting diversified teaching means

- 1) Using modern information technology means, such as MOOCs, Microlecture, online teaching, etc., to provide students with more flexible and diversified learning methods.



2) Teaching methods such as case teaching and project-based teaching are introduced to enable students to learn and master the knowledge and skills of pharmaceutical engineering through participation and practice.



## 2.4 Create an innovation atmosphere and build an innovation platform

### 2.4.1 Establish an innovation incentive mechanism

1. Set up innovation scholarships, innovation funds and other reward mechanisms to encourage students to actively participate in innovation activities and achieve excellent results.
2. Hold innovation competitions, innovation forums and other activities to provide a platform for students to display their innovation achievements and exchange innovation experience. In order to cultivate students' engineering consciousness and practical ability and strengthen teachers' engineering practice guidance ability, students are encouraged to participate in the "National College Students Pharmaceutical Engineering Design Competition" and chemical design Competition every year. The proposition model combined with engineering design examples by industry experts has integrated the advanced concepts and advanced technologies of the pharmaceutical industry. It also exposes students to the latest requirements of pharmaceutical production quality management.

### 2.4.2 Establishment of innovation practice platform

1. Establishment of pharmaceutical engineering innovation laboratory, innovation studio and other practice platforms to provide students with a good environment and conditions for innovation practice.

2. Strengthen cooperation and exchanges with pharmaceutical enterprises and research institutes, jointly build a platform for industry-university-research cooperation, and promote innovation and development in the field of pharmaceutical engineering.

## 2.5 Cultivate teamwork spirit and cross-cultural communication ability

### 2.5.1 Strengthen team spirit

1. Cultivate students' team spirit and collaboration ability through team projects, collaborative learning and other ways.
2. Encourage students to participate in interdisciplinary and cross-field cooperation projects to improve students' comprehensive literacy and collaboration ability.

### 2.5.2 Improving intercultural communication ability

1. Offering intercultural communication courses or activities to cultivate students' intercultural communication ability and international vision.
2. Encourage students to participate in international exchange programs, overseas internships and other activities to broaden students' international vision and cross-cultural exchange experience.

## 3. CONCLUSION

The cultivation of innovative consciousness of new engineering talents in pharmaceutical engineering under the background of the cross-integration of new business forms and new technologies requires to take comprehensive measures from the aspects of education concept, curriculum system, teaching methods, innovation atmosphere, teamwork and cross-cultural communication ability. Only in this way, can we cultivate high-quality talents with innovative spirit and practical ability to meet the development needs of the future pharmaceutical engineering field.

**Conflicts of Interest:** The authors declare no conflict of interest.

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